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errors of direction which group about the point of stimulation, while the results of our experiments show a tendency to localize certain points in certain areas. These differences are doubtless attributable to differences in method. Ponzo employed a stimulus that was not free from pressure, his observers localized by touching the arm, and the warm spots were localized but five times as against our ten.

XXI. FORM *vs.* INTENSITY AS A DETERMINANT OF ATTENTION

By L. G. MEADS

President Sanford once asked the senior editor of these studies if it might not be possible to compare form and intensity of stimulus, in some quantitative way, as regards their power to compel the attention. The present experiments give a first, rough-and-ready answer to this question in a single case. A light-form of varying intensity was compared with a 'formless' spot of light of fixed intensity, and that ratio of the objective intensities was determined at which the two stimuli were judged equally clear.

Apparatus.—The apparatus consisted of a projection lantern with tachistoscopic attachment; a black box with three openings, one to admit the light of the lantern, and two front circular openings (8 cm. in diameter, 18 cm. apart) covered with ground glass, through which the light passed to a large ground glass screen (150 by 105 cm.); and an episcope placed between box and screen. The tachistoscope gave an exposure of a tenth of a second (110 ± 8 sigma). One-half of the screen was covered with a sheet of thick paper, in the centre of which was cut a square cross (9 by 9 cm.; width of arms, 4 cm.); the episcope was placed always on the same side as the cross. A small electric bulb, set midway between the stimuli, served as fixation-point. The 'formless' spot was, of course, roughly circular; it had a bright central area of some 12 cm. in diameter, and a total diameter of some 17 cm., and was therefore considerably larger than the cross; it made an impression of vagueness and diffuseness, and the observers never named its form, but referred to it as the 'spot' or 'patch' of light.

The observations were made in the dark room and with dark adaptation. The observers sat at a distance of 3.75 m. from the screen.

Method.—The instructions were as follows: "At the signal Now! you will fixate the spot on the glass; a second and a half later, two spots of light will be shown. You are to report which of the two (if either) is the more clear." The observer was further instructed that observations would be made in series, in some of which the one and in others the other spot would at first be definitely the clearer.

In the descending series the light of the cross was cut down to 180° of the episcope, while the formless spot was presented at full intensity; in the ascending series the light of the cross was cut down to 84° . Preliminary experiments had shown that at 180° the cross would always be the clearer, and at 84° would always be the less clear stimulus. The steps in both series were 12° .

Two observers made 40 series; ten ascending and ten descending with the cross on the right, and the same number with the cross on

the left. These observers were Professor H. P. Weld, and Mr. J. S. Smith, a graduate student. Three observers made 8 series; two ascending and two descending with the cross on the right, and the same number with the cross on the left. These observers were Mr. H. G. Bishop, assistant in psychology, and Drs. E. G. Boring and W. S. Foster, instructors.

Judgments were passed in the form 'spot' (or 'patch'), 'cross,' 'equal.' Preliminary experiments showed both that there is a tendency to name the clearer stimulus, and also that, if the judgments 'clearer,' 'less clear' are required, the attention is likely to be focussed upon the one or the other stimulus with a view to comparison.

Results.—With full intensity of the formless spot, judgments of equal clearness were obtained for the following intensities of the cross:

Observer	Degrees	M. V.
H. P. W.	135	9.2
J. S. S.	136.5	13.7
H. G. B.	132	21.0
E. G. B.	118.5	8.0
W. S. F.	142.5	16.8

The following excerpts from the introspective reports may be quoted:

E. G. B.—"I am conscious of a difference of intensity even when judging clearness in the reverse order." "The judgment of clearness seems very much tied up with intensity. I would sometimes think 'That is intense enough to make them equal in clearness,' although the intensities were obviously unequal." "I noticed the clear-cutness of the cross even though the spot was the more clear."

H. G. B.—"Easy to judge. Clearness stood out in one even though intensity was very much less in that one."

W. S. F.—"You seem to have to let yourself be blank, or rather to attend to both,—no previous attending to one. You attend to both, only one is clearer than the other."

H. P. W.—"The judgment is very easy provided only the observer can avoid any sort of expectancy before the stimulus appears. If, however, one should expect 'spot' (let us say) to be more clear, then one is very apt to judge it so, unless the difference in intensity is very great."

Conclusion.—We conclude that a light-form of relatively low intensity may have as great a power to attract attention as a formless light of relatively high intensity. In the concrete, a cross illuminated by some 133° of the light of a 25 w. 110 v. mazda lamp sent through two ground glasses may be as clear as a formless patch illuminated by the full 360°.

This is a single result, obtained with a somewhat rude technique; but the technique can be improved; and the ease of judgment renders it probable that the comparison of form and intensity can be made with other material.